# Visual Basic - Chapter 1

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* Adopted from An Introduction to Programming Using Visual Basic 2010, Schneider

# Chapter 1 - An Introduction to Computers and Problem Solving

- 1.1 An Introduction to Computers
- 1.2 Windows, Folders, and Files
- 1.3 Program Development Cycle
- 1.4 Programming Tools

# 1.1 An Introduction to Computers

- Miscellaneous Questions

# Communicating with the Computer

- Machine language – low level, hard for humans to understand
- Visual Basic – high level, understood by humans, consists of instructions such as Click, If, and Do

# Compiler

- A compiler translates a high-level language into machine language.
- The Visual Basic compiler points out certain types of errors during the translation process.

# Programming and Complicated Tasks

- Tasks are broken down into instructions that can be expressed by a programming language
- A *program* is a sequence of instructions
- Programs can be only a few instructions or millions of lines of instructions

# All Programs Have in Common:

- Take data and manipulate it to produce a result
- Input – Process – Output
  - Input – from files, the keyboard, or other input device
  - Output – usually to the monitor, a printer,  or a file

# Hardware and Software

- Hardware – the physical components of the computer
  - Central processing unit
  - Disk drive
  - Monitor
- Software – The instructions that tell the computer what to do

# Programmer and User

- Programmer – the person who solves the problem and writes the instructions for the computer
- User – any person who uses the program written by the programmer

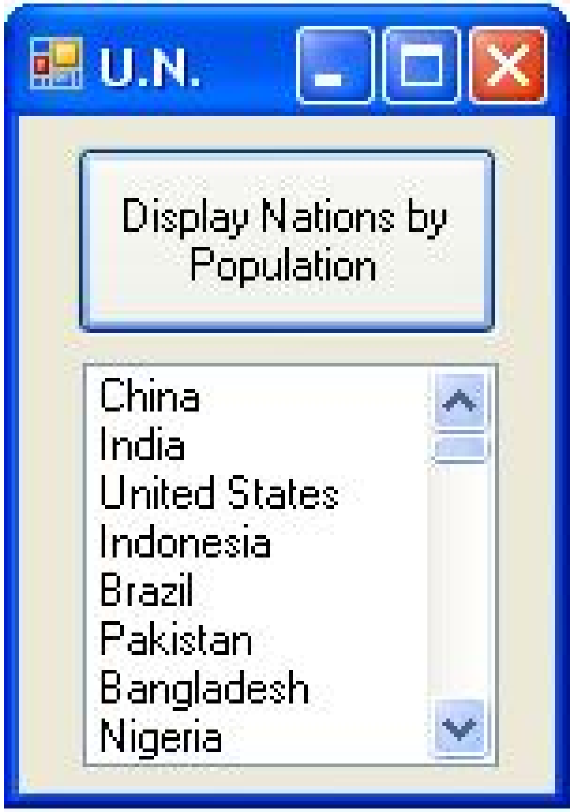
# Problem Solving

- Developing the solution to a problem
- Algorithm – a step by step series of instructions to solve a problem

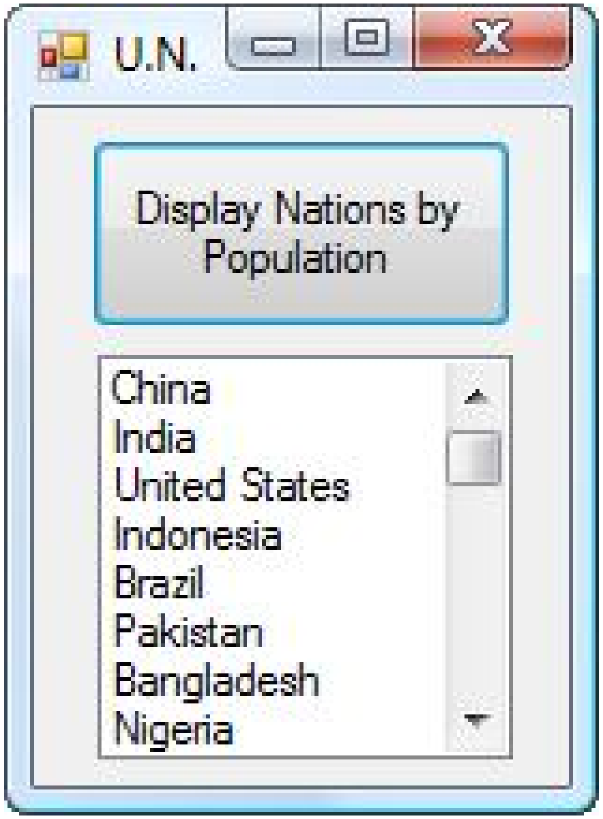
# Visual Basic 2010

- BASIC originally developed at Dartmouth in the early 1960s
- Visual Basic created by Microsoft in 1991
- Visual Basic 2010 is similar to original Visual Basic, but more powerful

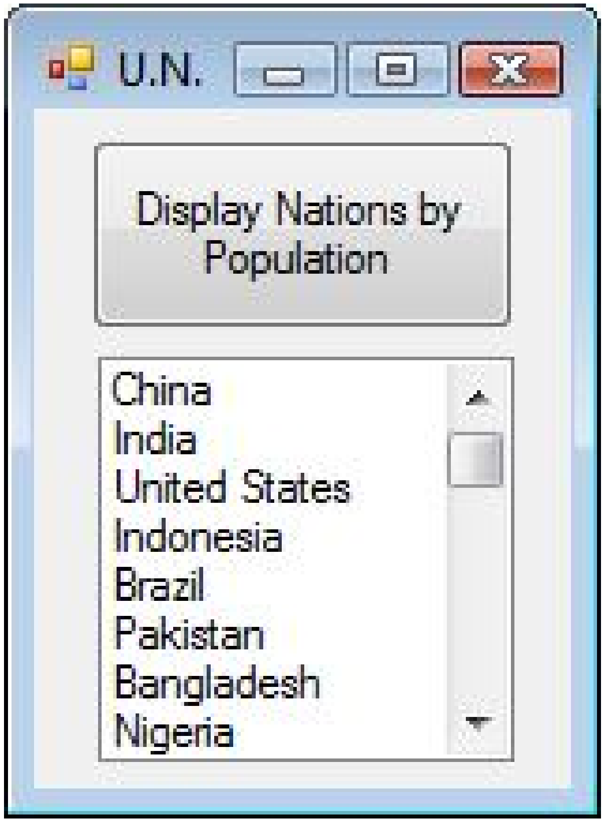
# XP vs Vista vs Windows 7



XP



Vista



Windows 7

# 1.2 Windows, Folders, and Files

- Windows and Its Little Windows
- Mouse Actions
- Files and Folders

# Windows and Its Little Windows

- Difference between *Windows* and *windows*.
- Title bar indicates if window is active.

# Mouse Actions:

- Hover
- Drag and drop
- Click
- Right-click
- Double-Click

# Files and Folders

File: holds programs or data. Its name usually consists of letters, digits, and spaces.

Folder: contains files and other folders (called subfolders).

# Key Terms in using Folders and Files

| Term | Example |
|---|---|
| Disk | Hard disk, flash drive, DVD |
| File name | Payroll |
| Extension | .txt |
| Filename | Payroll.txt |
| Path | TextFiles\Payroll.txt |
| Filespec | C:\TextFiles\Payroll.txt |

# Windows Explorer

- Used to view, organize, and manage folders and files.
- Manage: copy, move, delete

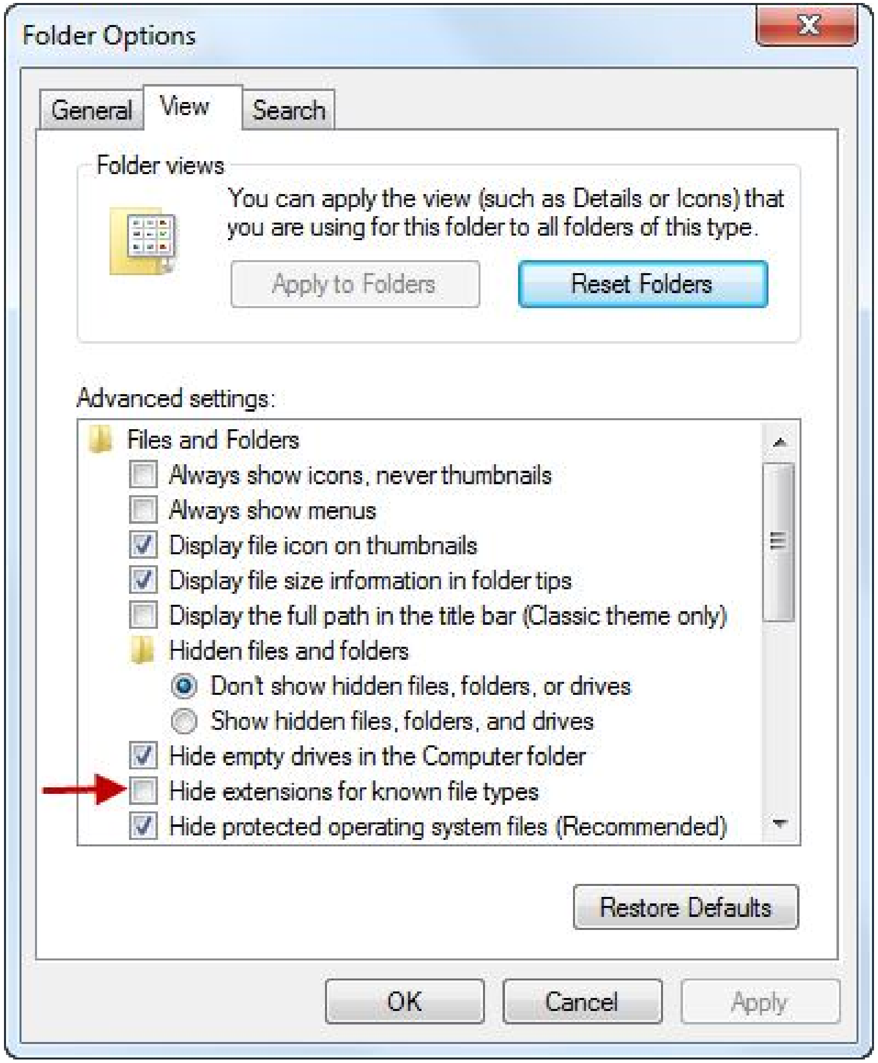
# Invoking Windows Explorer

- Right-click on Windows Start button
- Click on Explore (or Open Windows Explorer) in context menu

# Display File Extensions (Vista & Windows 7)

- Click on Windows Start button.
- Type Folder Options into Search box.
- Press Enter key.
- Click on View tab in dialog box.
- Uncheck ″Hide extensions for known file types”.
- Click on *OK*.

# Display File Extensions (Vista & Windows 7 cont.)



Folder Options

General | View | Search

Folder views

You can apply the view (such as Details or Icons) that you are using for this folder to all folders of this type.

Apply to Folders | Reset Folders

Advanced settings:

Files and Folders
- □ Always show icons, never thumbnails
- □ Always show menus
- ☑ Display file icon on thumbnails
- ☑ Display file size information in folder tips
- □ Display the full path in the title bar (Classic theme only)
- Hidden files and folders
  - ● Don't show hidden files, folders, or drives
  - ○ Show hidden files, folders, and drives
- ☑ Hide empty drives in the Computer folder
- □ Hide extensions for known file types
- ☑ Hide protected operating system files (Recommended)

Restore Defaults

OK | Cancel | Apply

# Display File Extensions (XP)

- Alt/Tools/Folder Options
- Click the View tab.
- Uncheck "Hide extensions for known file types“.
- Click on *OK*.

# 1.3 Program Development Cycle

- Performing a Task on the Computer
- Program Planning

# Terminology

A computer program may also be called:

- Project
- Application
- Solution

# Program Development Cycle

- Software refers to a collection of instructions for the computer
- The computer only knows how to do what the programmer tells it to do
- Therefore, the programmer has to know how to solve problems

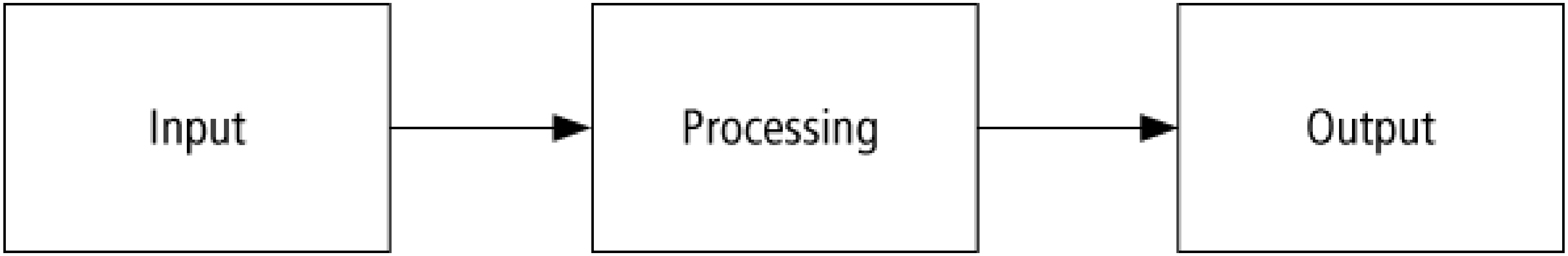
# Performing a Task on the Computer

- Determine ***Output***
- Identify ***Input***
- Determine ***process*** necessary to turn given ***Input*** into desired ***Output***

# Problem-Solving: Approach Like Algebra Problem

- How fast is a car traveling if it goes 50 miles in 2 hours?
- ***Output***: a number giving the speed in miles per hour
- ***Input***:  the distance and time the car has traveled
- ***Process***: speed = distance / time

# Pictorial representation of the Problem Solving Process



Input

Processing

Output

# Program Planning

- A recipe is a good example of a plan
- Ingredients and amounts are determined by what you want to bake
- Ingredients are input
- The way you combine them is the processing
- What is baked is the output

# Program Planning (continued)

- Always have a plan before trying to write a program
- The more complicated the problem, the more complex the plan must be
- Planning and testing before coding saves time

# Program Development Cycle

1. Analyze: Define the problem.
2. Design: Plan the solution to the problem.
3. Choose the interface: Select the objects (text boxes, buttons, etc.).

# Program Development Cycle (continued)

4. Code: Translate the algorithm into a programming language.
5. Test and debug: Locate and remove any errors in the program.
6. Complete the documentation: Organize all the materials that describe the program.

# 1.4 Programming Tools

- Flowcharts
- Pseudocode
- Hierarchy Chart
- Direction of Numbered NYC Streets Algorithm
- Class Average Algorithm

# Programming Tools

Three tools are used to convert ***algorithms*** into computer programs:

- ***Flowchart*** - Graphically depicts the logical steps to carry out a task and shows how the steps relate to each other.
- ***Pseudocode*** - Uses English-like phrases with some Visual Basic terms to outline the program.
- ***Hierarchy chart*** - Shows how the different parts of a program relate to each other.

# Algorithm

A step-by-step series of instructions for solving a problem (a recipe is an example of an algorithm).

# Problem Solving Example

- How many stamps should you use when mailing a letter?
- One rule of thumb is to use one stamp for every five sheets of paper or fraction thereof.

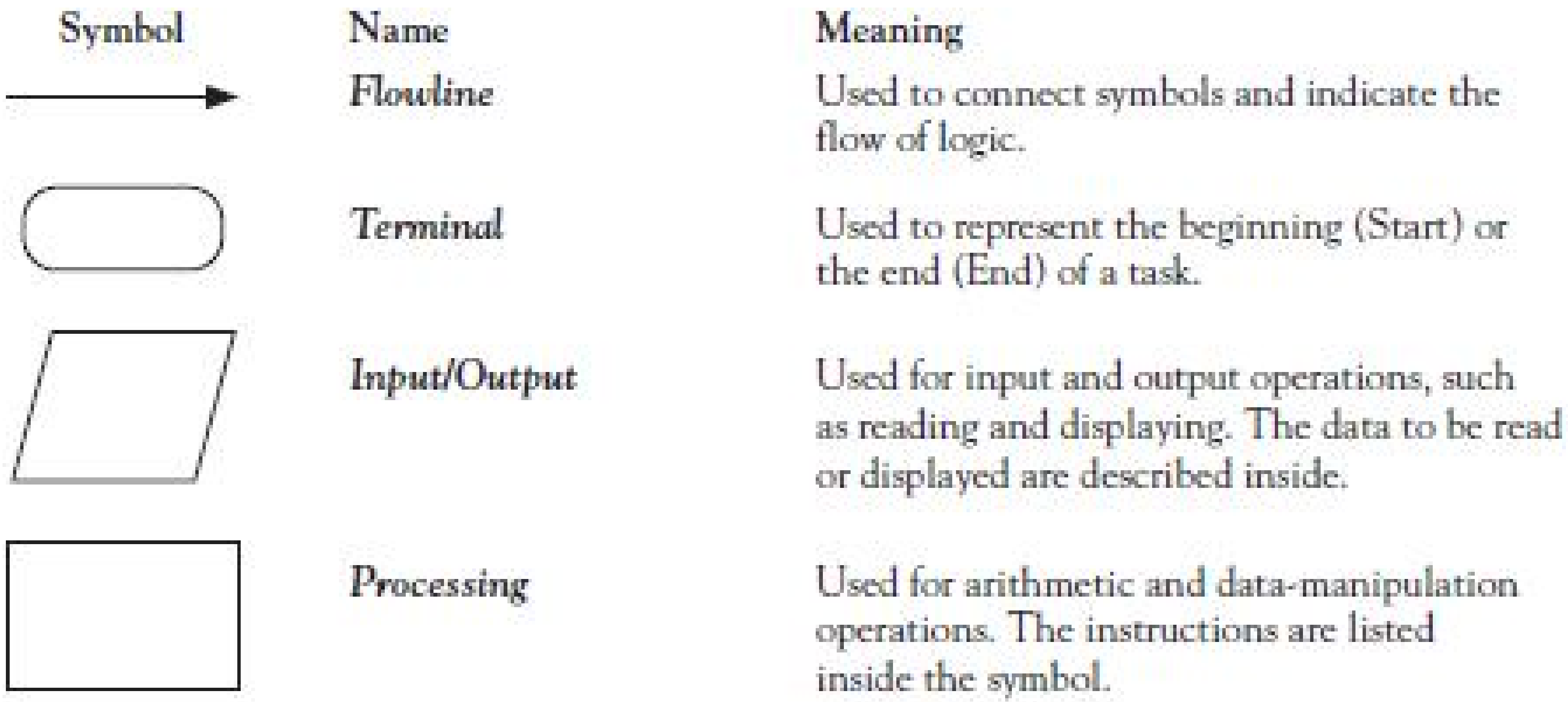
# Algorithm

1. Request the number of sheets of paper; call it Sheets. *(**input**)*
2. Divide Sheets by 5. *(**processing**)*
3. Round the quotient up to the next highest whole number; call it Stamps. *(**processing**)*
4. Reply with the number Stamps. *(**output**)*

# Flowchart

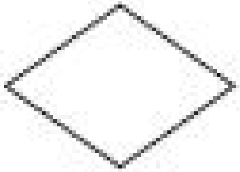
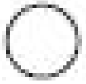
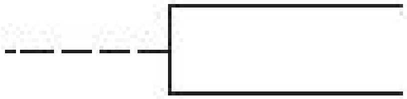
Graphically depicst the logical steps to carry out a task and show how the steps relate to each other.

# Flowchart Symbols

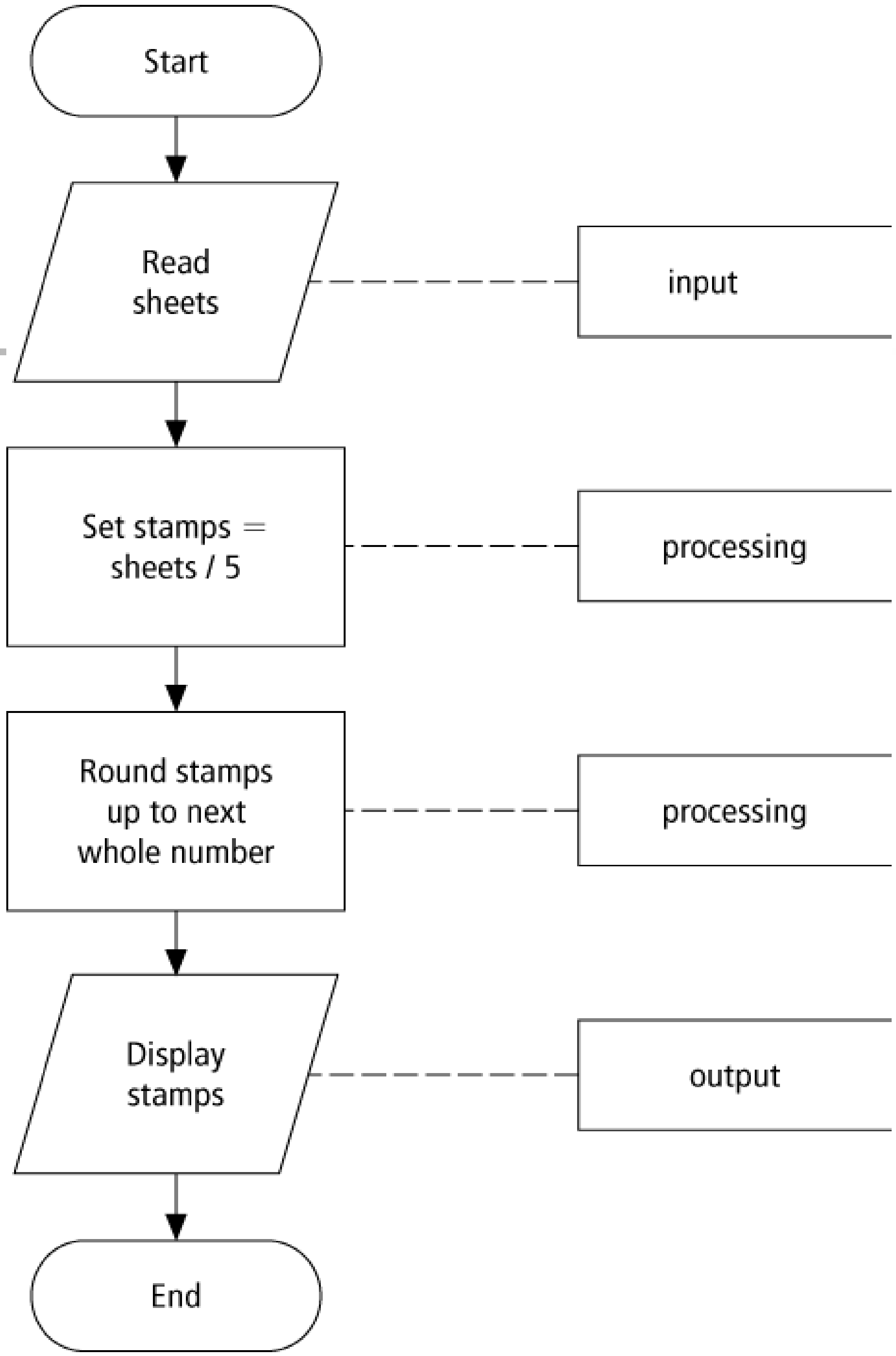


| Symbol | Name | Meaning |
|---|---|---|
| → | *Flowline* | Used to connect symbols and indicate the flow of logic. |
| ⬭ | *Terminal* | Used to represent the beginning (Start) or the end (End) of a task. |
| ▱ | *Input/Output* | Used for input and output operations, such as reading and displaying. The data to be read or displayed are described inside. |
| ▭ | *Processing* | Used for arithmetic and data-manipulation operations. The instructions are listed inside the symbol. |

# Flowchart Symbols (continued)

| | | |
|---|---|---|
|  | *Decision* | Used for any logic or comparison operations. Unlike the input/output and processing symbols, which have one entry and one exit flowline, the decision symbol has one entry and two exit paths. The path chosen depends on whether the answer to a question is "yes" or "no." |
|  | *Connector* | Used to join different flowlines. |
|  | *Annotation* | Used to provide additional information about another flowchart symbol. |

# Flowchart Example



# Pseudocode

Uses English-like phrases with some Visual Basic terms to outline the task.

# Pseudocode Example

```
Determine the proper number of stamps for a letter
Read Sheets (input)
Set the number of stamps to Sheets / 5 (processing)
Round the number of stamps up to the next whole number (processing)
Display the number of stamps (output)
```

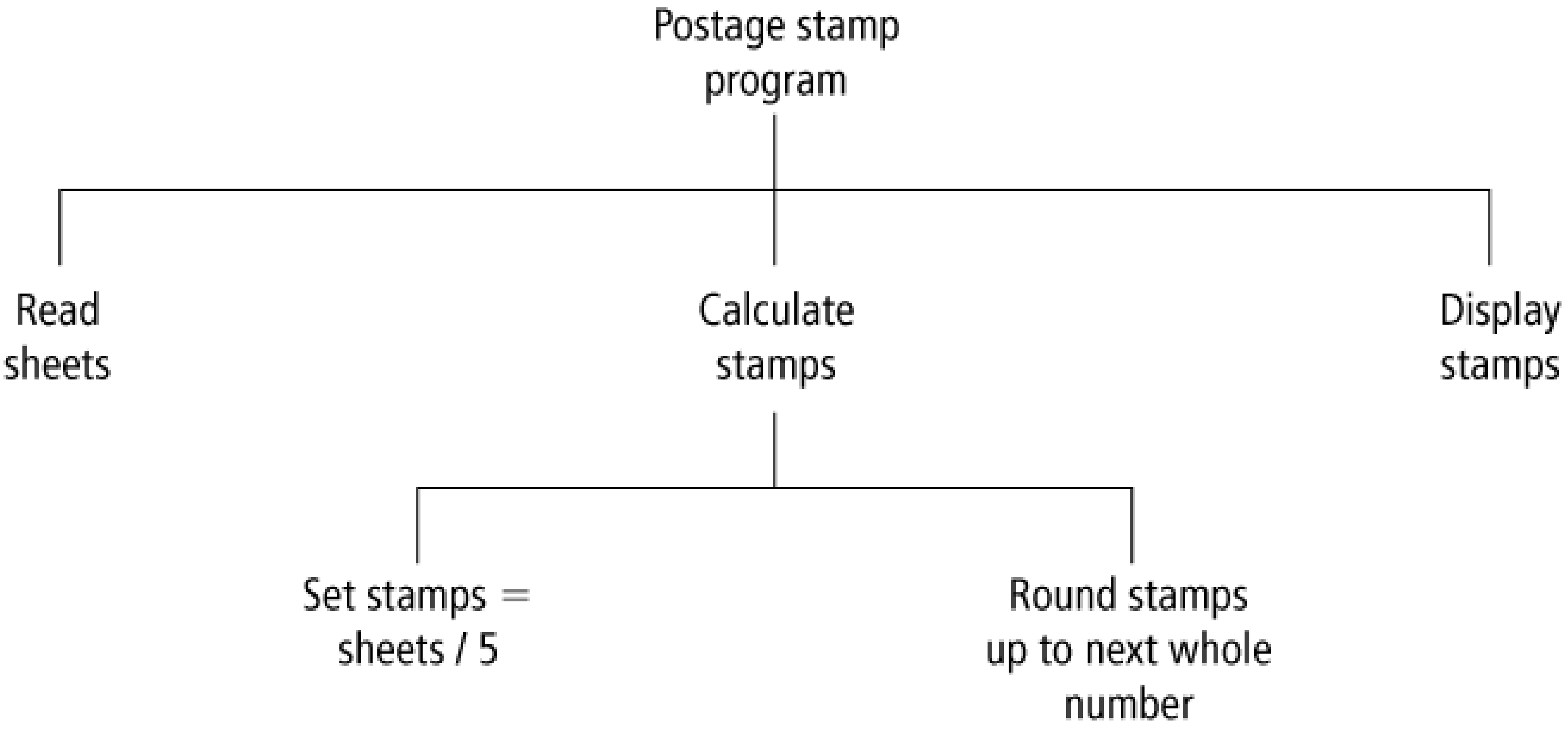
# Hierarchy Chart

- Shows how the different parts of a program relate to each other

Hierarchy charts are also called

- structure charts
- HIPO (Hierarchy plus Input-Process-Output) charts
- top-down charts
- VTOC (Visual Table of Contents) charts

# Hierarchy Charts Example



Postage stamp program

Read sheets

Calculate stamps

Display stamps

Set stamps = sheets / 5

Round stamps up to next whole number

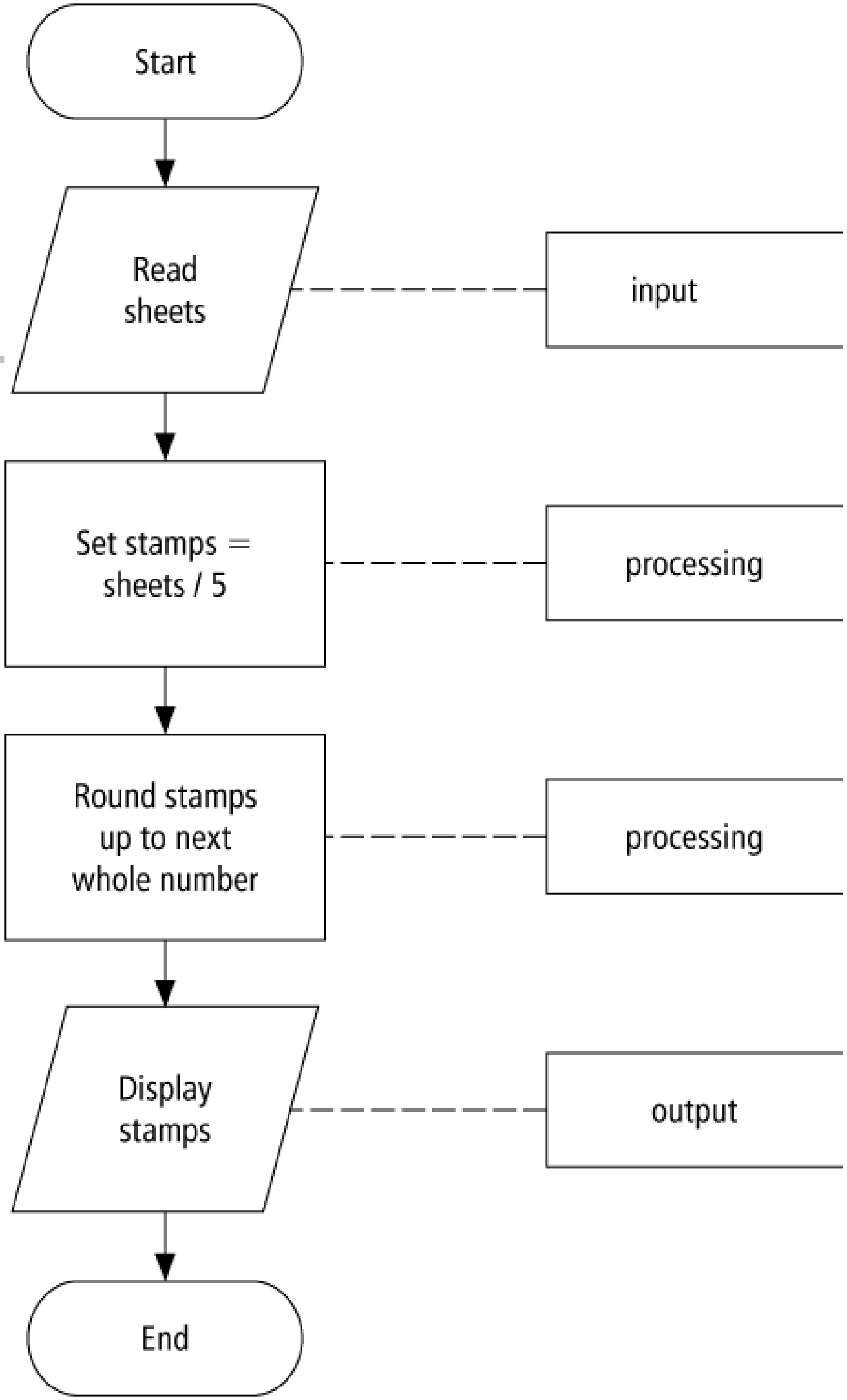
# Divide-and-Conquer Method

- Used in problem solving – take a large problem and break it into smaller problems
- Solve the small problems first

# Statement Structures

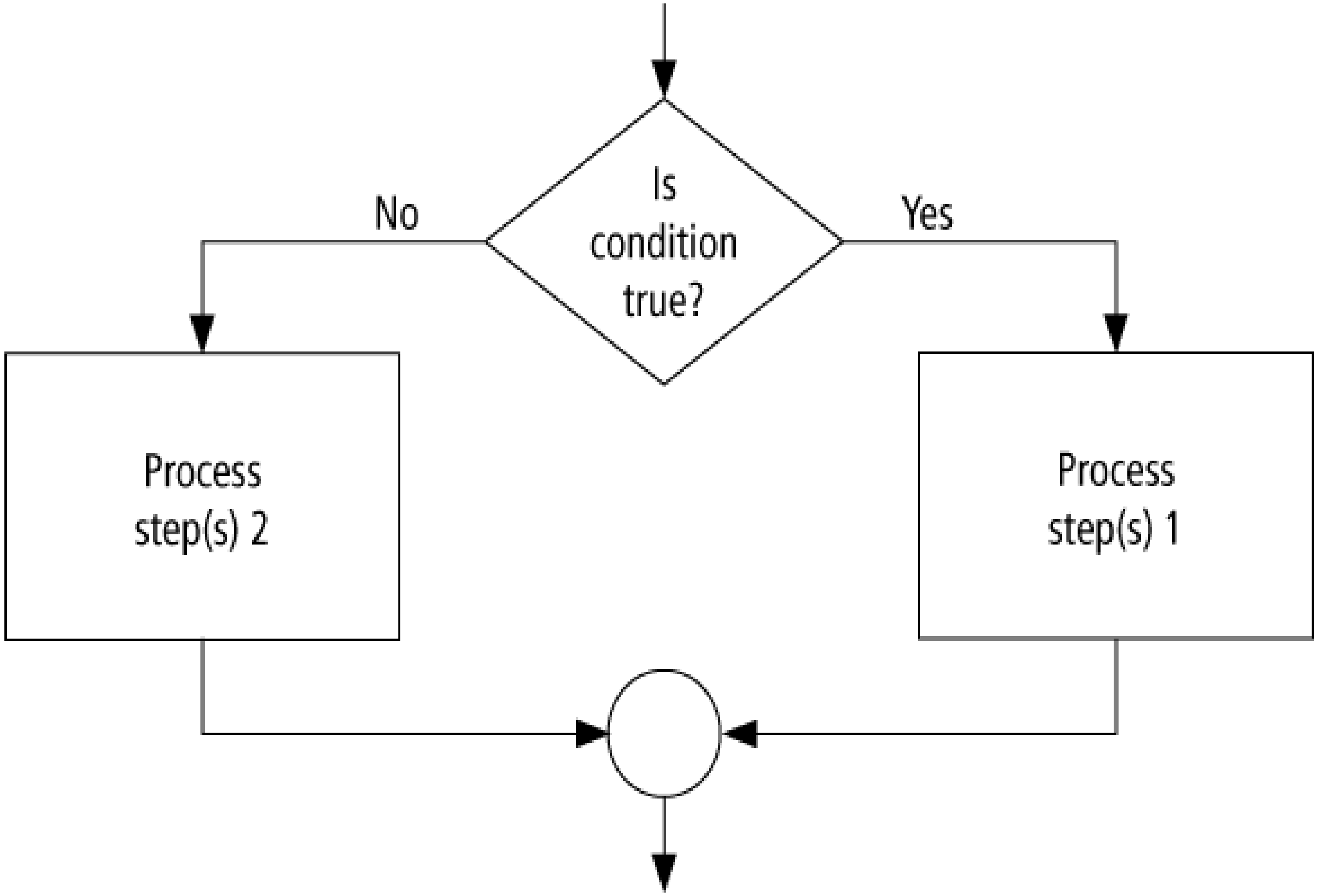
- Sequence – execute instructions from one line to the next without skipping over any lines
- Decision - if the answer to a question is “Yes” then one group of instructions is executed. If the answer is “No,” then another is executed
- Looping – a series of instructions are executed repeatedly

# Sequence Flow Chart



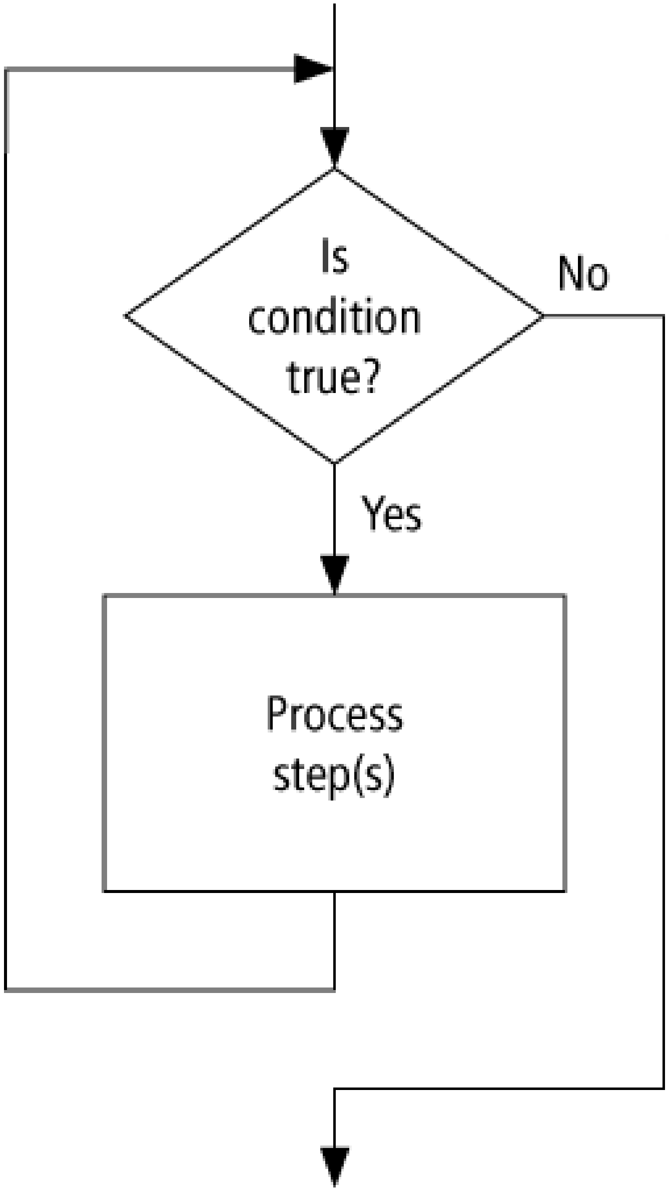
# Decision Flow Chart

```
If condition is true Then
        Process step(s) 1
   Else
        Process step(s) 2
End If
```



# Looping Flow Chart

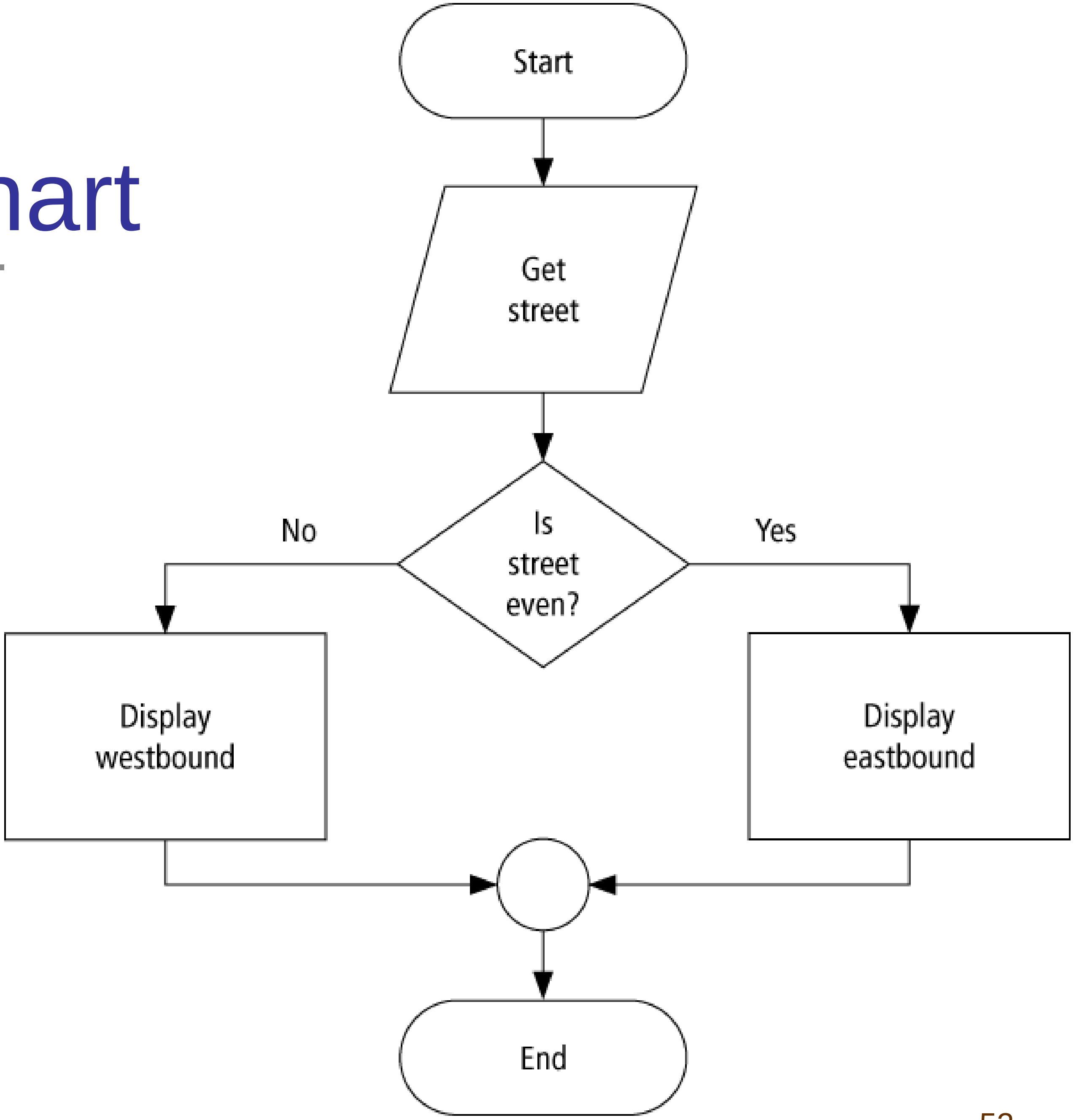
```
Do While condition is true
    Process step(s)
Loop
```



# Direction of Numbered NYC Streets Algorithm

- ***Problem:*** Given a street number of a one-way street in New York City, decide the direction of the street, either eastbound or westbound
- ***Discussion:*** in New York City even numbered streets are Eastbound, odd numbered streets are Westbound

# Flowchart

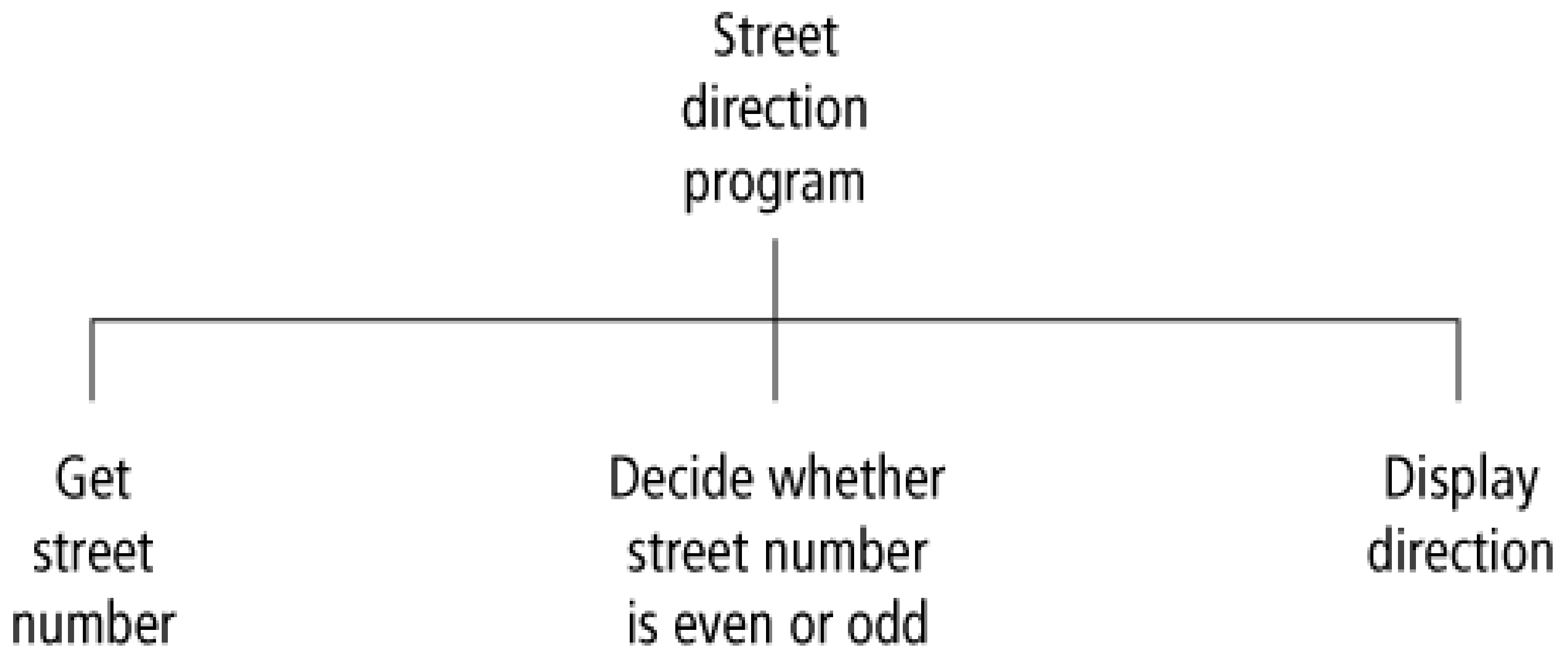

Start
Get street
Is street even?
No
Yes
Display westbound
Display eastbound
End

# Pseudocode

**Program**: Determine the direction of a numbered NYC street

```
Get street
If street is even Then
    Display Eastbound
Else
    Display Westbound
End If
```

# Hierarchy Chart



Street direction program

Get street number

Decide whether street number is even or odd

Display direction

# Class Average Algorithm

***Problem:*** Calculate and report the average grade for a class

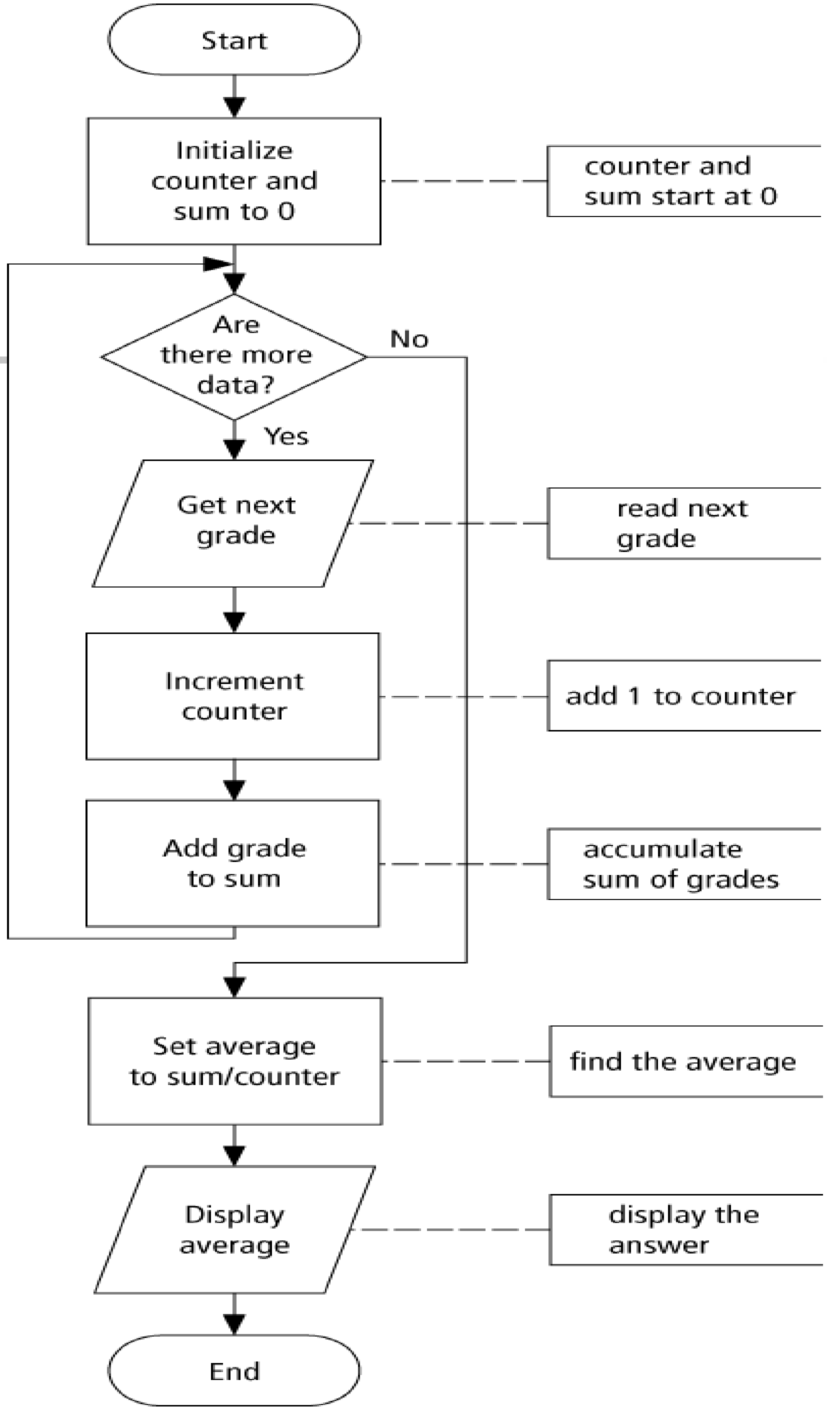
***Discussion:*** The average grade equals the sum of all grades divided by the number of students

***Input:*** Student grades

***Processing:*** Find sum of the grades; count number of students; calculate average

***Output:*** Average grade

# Flowchart



Start

Initialize counter and sum to 0

counter and sum start at 0

Are there more data?

No

Yes

Get next grade

read next grade

Increment counter

add 1 to counter

Add grade to sum

accumulate sum of grades

Set average to sum/counter

find the average

Display average

display the answer

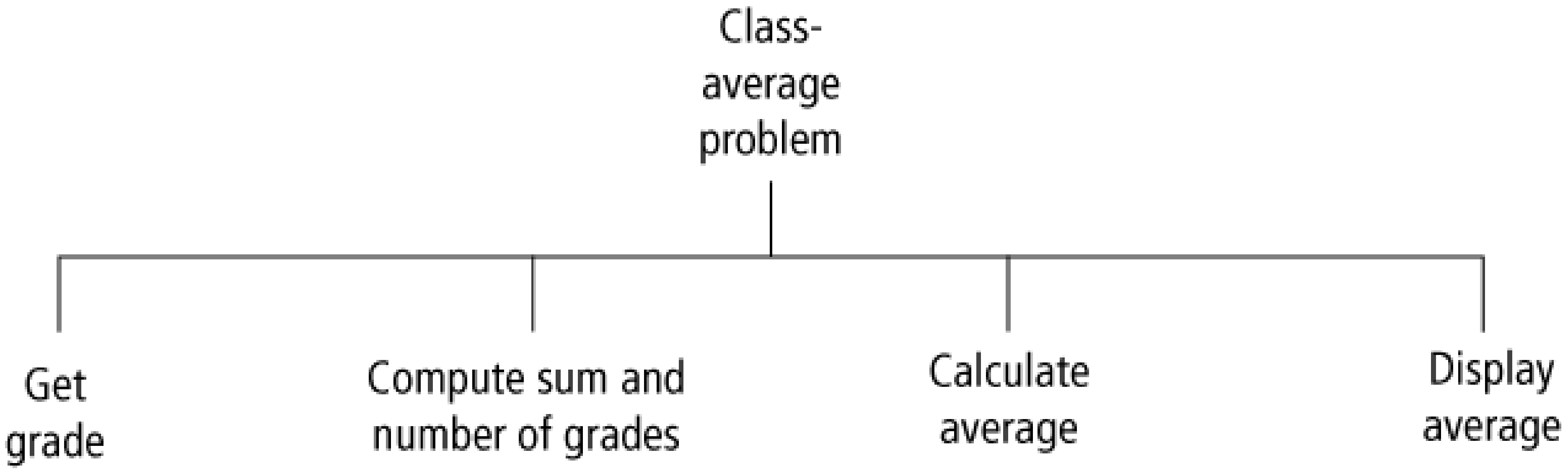
End

# Pseudocode

***Program***: Determine average grade of a class

```
Initialize Counter and Sum to 0
Do While there are more data
    Get the next Grade
    Add the Grade to the Sum
    Increment the Counter
Loop
Compute Average = Sum / Counter
Display Average
```

# Hierarchy Chart



# Comments

- When tracing a flowchart, begin at the start symbol and follow the flow lines to the end symbol.
- Testing an algorithm at the flowchart stage is known as **desk checking**.
- Flowcharts, pseudocode, and hierarchy charts are program planning tools that are in dependent of the language being used.

# Tips and Tricks of Flowcharts

- Flowcharts are time-consuming to write and difficult to update
- For this reason, professional programmers are more likely to favor pseudocode and hierarchy charts
- Because flowcharts so clearly illustrate the logical flow of programs, they are a valuable tool in the education of programmers